

REMARKS/ARGUMENTS

Claim 15 has been objected to by the Examiner for the reason that the incorrect "Previously Presented" form was set forth in the Amendment filed on June 15, 2006. This inadvertent error has been corrected in the present Amendment.

Claims 1-15 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement for the reason that the phrase "a plurality of machine tools(1) constructed" is not supported in the specification. The claims, as amended herein, now recite a plurality of injection presses (1) "for connection" to a network and thus should now obviate the rejection under 35 U.S.C. 112, first paragraph.

Claims 1-15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Gernert et al. (U.S. Patent No. 6,600,734) in view of Kitahata et al. (U.S. Patent No. 6,037,400). For the reasons set forth hereinafter, it is submitted that new independent claim 16 and the dependent claims 5-15, 17 and 18, as amended herein, clearly distinguish over the teachings of the cited references and are not rendered obvious thereby.

The present application relates to a network connection system for injection presses for plastics, comprising a plurality of injection presses for connection to a network managed by a server to share common resources and exchange data, each injection press comprising an industrial computer that controls the operation of the press, the network connection system comprising radio communications devices installed in the industrial computers of the injection presses, and at least one wireless communication device connected to the server for communicating with the radio communications devices installed in the industrial computers of the injection presses through radio communication in frequency bands available for radio

communications, so that a wireless network is formed between the industrial computers of the injection presses and the server.

As set forth on pages 5 and 6 of the specification, the network connection system of the present invention has many advantages over the prior art, some of which are as follows:

1. There is the possibility of completely freeing the plant lay-out from the need to reach the machines or other devices with a data transmission network. Consequently, the machines can be moved and distributed in the plant without any constraint.

2. The complete absence of wiring in the connection of the machines to the network makes it possible to achieve a highly resilient network and avoids interruptions caused by damage to the transmission line. Also, one or more machines can be turned off without losing the connection to the others.

3. The connection of the machines to the network is very simple. From the moment of installation of a machine, the connection of the machine to the network is immediately available. No network technician is needed when installing a new machine on the network since all setting up can be carried out by the manufacturer of the machine during testing procedures or remotely via the remote connection to the network server.

4. Network connection of the machines makes the data present on the machines available for management of automatic real-time production control. It is possible to load on to the computer of the machine data such as new processing files, quantities required for production batches and in general all the data that would otherwise have to be set up directly on the machine. Such data is available on the local server and on all other computers placed on the same network.

5. In the case of the server also acting as a bridge toward other networks, the data can be received or sent from computers situated on other LAN networks with which the server is connected.

6. If the server is connected with an analogical or digital modem device for connection to other data networks, the network of the machines can be connected by means of a point-to-point connection with a remote computer or can be connected to the Internet. These types of connections make it possible to carry out services of remote assistance, machine monitoring or sending of service request messages by the machines.

A history of Applicant's invention may help the Examiner to understand the new and improved aspects of the invention as set forth in the claims as amended herein.

In the field of injection moulding there was initially no need to connect presses to a local area network (LAN) for their normal working. Such a need arose at the end of the '90s because of tele-assistance need. In fact, the connection of an injection moulding press to a LAN allows its remote control, in order to perform technical assistance, without the technicians having to move to the plant where the press is located. This is a great economic advantage for the press producers.

The first proposals in such field were wired serial connections of injection moulding machines to a LAN. However the wired connections of injection moulding machines to a LAN involve many drawbacks, due to the presence of channels into the plant for passing the wires from the machines to the LAN. This was not accepted by the owners of injection moulding plants for the reason that the production line of an injection moulding plant is very versatile and the layout of the line can change according to the production. Therefore, it must be possible to move the presses freely within the plant. As a result, the plants' owners were willing to forgo the

advantages of a network connection to avoid the provision of channels for the installation of a fixed cable network. It is to be noted that, for the above reasons, only 10% of the existing injection moulding presses are connected to a network.

Starting from this state of the art, the objective technical problem to be solved is how to avoid a wired connection of a press to a network. The applicant has performed comprehensive researches, tests and studies in order to solve this technical problem. Before the filing date of the present application, a conveyed wave communication system was available in the industrial field which used the power cables of the press as transmission means for conveyed waves. The applicant performed some tests with such a conveyed wave communication system in order to connect a press to a LAN. These tests have never been successful, because the power cables offered a narrow band and only a limited amount of data could be transmitted. Furthermore the transmission was subjected to interference noise due to the transients of the inverters provided on the press motors. As a result much data got lost despite the use of special filters implemented to eliminate the transient noise.

Accordingly, applicant has carried out his problem-solving research outside the industrial field. Wireless networks were known in the office field. Such wireless networks ensured a large band transmission with little transmission errors.

It is to be noted that at the filing date of the present application the wireless communication devices available on the market were specifically designed for PCs provided with the most common operative systems (Windows and Macintosh). In fact, the drivers of such wireless communication devices are installed in the operative system of the PC with the well known "plug and play" system.

The applicant has researched implementations of such a wireless network outside the office field. He found out that a wireless network was used in the medical field in order to connect a plurality of monitoring devices (ECG) applied on the patients to a central PC controlled by a doctor.

However the applicant has not found implementations of wireless networks in the industrial field. In fact, one skilled in the art would not maintain that a wireless network could work in the industrial field and in particular in the injection moulding field, because of the following prejudices:

1. It is to be noted that the microwaves are reflected by metal. Injection presses are mainly made of metal, with a great iron bulk. Therefore, skilled persons maintained that the iron bulk of the presses could cause a reflection of the microwaves emitted by the wireless transmitter, leading to interference disturbances between the reflected microwaves, such that the wireless receiver could not correctly receive the transmitted microwaves.

2. It is to be noted that materials which contain water absorb the microwaves. In an injection moulding plant there are a lot of materials which contain water, such as thick concrete walls, or materials in storage, such as cardboard, plastic, wood and the like. Therefore skilled persons maintained that the materials which contain water could cause an absorption of the microwaves emitted by the wireless transmitter, leading to a great reduction of the microwaves such that the wireless receiver could not correctly receive the transmitted microwaves.

3. It is to be noted that microwaves are disturbed by other radiation, such as transient phenomena. Injection presses are operated by electric motors driven by inverters. When the inverters are turned on and off transient phenomena occur on the power cables of the presses. As a result, such cables, if not properly shielded, act as irradiating antennas and the radiation thereof may disturb the microwaves emitted by the wireless device.

In spite of the above prejudices, applicant has performed some tests in order to implement a wireless network to injection moulding presses. The first tests were unsuccessful, since the wireless devices are not adapted for industrial computers and many transmission errors occurred during the wireless transmission.

It is to be considered that an injection moulding machine is provided with an industrial computer that controls all the operations of the press, i.e. the industrial computer controls directly the drivers of the mechanical members of the press, such as actuators, inverters, motors and the like. Such an industrial computer is provided with an operative system of the real-time (timing) type. In fact the main object of the operative system is to control exactly the components of the machine.

The real-time operative system of an industrial computer is very different from a non-real-time operative system of a PC which has the main object of displaying information to the user. Therefore, the drivers of the wireless devices available on the market were not suitable for a real-time operative system of an industrial computer, because the wireless device was created for a non real time operative system of a PC. As result the applicant had implemented new special drivers for adapting the wireless device to a real time operative system of an industrial computer. However, during following tests with special drivers for a real-time operative system, the applicant experienced many transmission errors, due to the aforementioned reasons (reflection disturbances, absorption disturbances and interference disturbances). To solve these drawbacks the applicant has implemented a system which finds the correct position of the antenna of a wireless device in order to have the best communication with the other wireless devices.

Furthermore, it is to be considered that the wireless transmission provides for an error correction protocol. In fact information is transmitted by packets of data with control words. During the transmission, if a packet is altered, the receiver does not receive the control word and the packet is delivered again. Such error correction protocol was implemented for an office environment wherein the reflection, absorption and interference disturbances are minimal. Therefore the error correction protocol of the prior art was inadequate for an industrial environment where there are many disturbances. As result, the appellant has implemented a new special error correction protocol which considers a higher error probability.

Accordingly, the set-up of an adequate wireless network in an industrial environment was not an obvious routine for the applicant. In fact, applicant has settled the following implementations:

1. Implementation of new special drivers for real-time operative system of industrial computers.
2. Implementation of a system that finds out the correct position of the antenna of a wireless device with respect to the other wireless device.
3. Implementation of new special error correction protocols considering a higher error probability.

In view of the above, it is submitted that the claims, as amended herein, which are specifically directed to an injection presses network communication system and which specify that the devices for radio communications are installed on the industrial computers of the injection presses, are new and inventive and should be allowable over the prior art.

New claim 16 and dependent claims 5-15, 17 and 18 all specifically recite a network connection system for injection presses for plastics, comprising a plurality of injection presses for connection to a network managed by a server to share common resources and exchange data,

each injection press comprising an industrial computer that controls the operation of the press, the network connection system further comprising radio communications devices installed in the industrial computers of the injection presses, and at least one wireless communication device connected to the server for communicating with the radio communications devices installed in the industrial computers of the injection presses, through communication and frequency bands available for radio communications, so that a wireless network is formed between the industrial computers of the injection presses and the server. This novel network connection system is not rendered obvious by the teachings of the cited references.

Gernert discloses an apparatus for interfacing a wireless local area network with a wide area, cellular or public switched telephone network including the function of a wireless LAN base station or access point, and a gateway. The interface may contain one or more different types of gateways, including a PSTN voice gateway, an analog modem gateway, and others. The apparatus may function as a data downloading station for a portable computer, pen-like barcode reader or the like, and also transmits the downloaded data to an IP network, a WAN or the PSTN. There is clearly no disclosure or even a suggestion in Gernert of Applicant's novel network connection system for machine tools, in particular for injection presses for plastics, comprising a plurality of machine tools to be connected to a wireless network, where at least some of the machine tools comprise a device suitable to connect them to the wireless network through a radio communications link, as specifically recited in claim 16 and dependent claims 5-15, 17 and 18.

The Examiner recognizes that Gernert does not specifically teach a network connection system for machine tools, in particular injection presses for plastics. The portions of the

specification of Gernert specifically cited by the Examiner clearly do not disclose or even suggest a network connection system for any type of machine tools.

The Examiner alleges that, in a related art dealing with wireless and/or wired communication systems, Kitahata teaches machine tools, in particular injection presses for plastics. Accordingly, the Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to include Kitahata's machine tools with Gernert's telecommunications system.

It is submitted that the teachings of Kitahata fail completely to supply the deficiencies of Gernert with respect to the novel recitations in Applicant's claims. Kitahata discloses a composition for prevention of electric waves having both absorbing properties and shielding properties against electric waves. Carbon fiber or magnetic particles, or both, and graphitized carbon black are dispersed and incorporated into an insulating substrate so that the weight ratio of the graphitized carbon black to the carbon fiber, the magnetic particles or the sum of the two may be 0.3 to 5. First, it is apparent that the disclosure of Kitahata is completely non-analogous to the network connection system of the present invention. Second, there is clearly no disclosure in Kitahata of machine tools, in particular injection presses for plastics, or a network connection system for any type of machine tool. Third, there is no basis for combining the teachings of the Kitahata and Gernert references. It would require hindsight, after having the benefit of Applicant's disclosure, to even conceive of a combination of the Gernert and Kitahata references in the manner set forth by the Examiner in the Office Action. Finally, even if the teachings of Kitahata and Gernert are combined, with the result that the shielding material of Kitahata is used on the apparatus of Gernert, there would still be no disclosure or even a suggestion of the novel

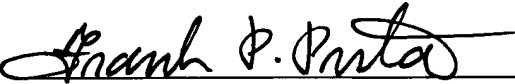
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network connection system for machine tools, as recited in claims 16, 5-15, 17 and 18, as amended herein.

In view of the above amendments and remarks, it is submitted that new claim 16, and dependent claims 5-15, 17 and 18, as amended herein, are clearly allowable over the teachings of the cited references. Prompt allowance of these claims is earnestly solicited.

Respectfully submitted,

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